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Governing for Growth in Georgia

GEORGIAN TEN YEAR NETWORK DEVELOPMENT PLAN

2015 - 2025 DEVELOPED BY GEORGIAN STATE ELECTROSYSTEM

COMMENTS AND RECOMMENDATIONS FOR THE NEXT TEN YEAR NETWORK DEVELOPMENT PLAN

23 March 2015

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COMMENTS AND RECOMMENDATIONS

GOVERNING FOR GROWTH (G4G) IN GEORGIA

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ACRONYMS

AC	Alternating Current
ACER	Agency for the Cooperation of Energy Regulators
ATC	Available Transfer Capacity
BSTNP	Black Sea Transmission Network Project
CO_2	Carbon Dioxide
DC	Direct Current
EC	European Community
EMCAS	Electricity Market Complex Adaptive System
ENTSO-E	European Network of Transmission System Operators for Electricity
EnCT	Energy Community Treaty
EU	European Union
G4G	USAID Governing for Growth in Georgia
GNERC	Georgian National Energy and Water Supply Regulatory Commission
GSE	Georgian State Electrosystem
GTC	Grid Transfer Capability
HV	High Voltage
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IT	Information Technology
MOE	Ministry of Energy
$MtCO_2$	Metric Ton CO_2
MW	Megawatt
MWh	Megawatt Hour
NREAP	National Renewable Energy Action Plan
NTC	Net Transfer Capacity
OHL	Overhead Lines
RES	Renewable Energy Sources
SO&AF	Scenario Outlook and Adequacy Forecast
TSO	Transmission System Operator
TTC	Total Transfer Capacity
TW	Terawatt
TWh	Terawatt Hour
TYNDP	Ten Year Network Development Plan
USAID	United States Agency for International Development
VSC	Voltage Source Converter

EXECUTIVE SUMMARY

Governing for Growth for Georgia (G4G) is a USAID 5-year initiative aimed at supporting the Government of Georgia to create a better enabling environment in which legal and regulatory reforms are fairly and transparently conceived, implemented and enforced providing a level playing field for small and medium size enterprise growth.

G4G will strengthen capacity of both public and private sectors to effectively cooperate on elaboration of the legislative changes required for the identified reforms through an inclusive consultative process.

To achieve the goal, G4G will support inclusive public-private dialogue for the effective formulation of reforms to drive economic development nurtured through transparent and accountable oversight of the state.

The purpose of this document is to provide key comments on the Georgia's Ten Year Transmission Network Development Plan (TYNDP), developed by Georgian State Electrosystem (GSE) and to provide recommendations for its improvement for the next ten year plan, for the years 2017 - 2026. The TYNDP is a key document for the electricity sector for timely and well planned development of the network infrastructure. The plan will also support the integration of new renewable energy sources (RES) to the electricity transmission grid. The TYNDP identifies gaps in infrastructure based on European standards and informs decision makers about projects with network wide-impact.

In developing this document, consideration is given to the Georgian energy policy goals, current transmission system expansion and rehabilitation plans, and consistency with the European Network of Transmission Operators for Electricity (ENTSO-E) approach to transmission planning. Further, the TYNDP must be developed in accordance with the Georgian Electricity Transmission Grid Code.

The next TYNDP (2017-2026) development, the key issues for GSE to consider include:

- Include social/economic indicators as part of the evaluation and prioritization of new transmission infrastructure projects.
- GSE should add a consultation process before approval of the TYNDP
- The basis for electricity system demand growth (energy and peak demand) should be correlated with GDP economic sector.
- Obtain a long-term hourly production model to further increase GSE's understanding of the particular needs of the system during different time periods (winter/summer, weekdays/weekends, day time/night time).
- Cooperate with regional TSOs to better understand the impacts of regional infrastructure and to eventually develop a regional TYNDP.
- Internal and external transmission congestion should take on the highest priority of new infrastructure projects.
- Begin work on the next TYNDP as the process, including the suggestions above, will take at least years to complete.

INTRODUCTION

The main purpose of creation of the TYNDP is to:

- Forecast the electricity sector demand and supply and identify potential resources to fill any identified shortfalls of generation capacity and energy;
- Identify investment necessary for facilitating the development of cross-border electricity trade;
- Integrate renewable energies into the electricity system; and
- Ensure the security of electricity supply.

The TYNDP must provide a shared vision on power system development for the foreseeable future and ensure greater transparency with regard to the development of the entire electricity transmission network. It shall include:

- Modelling of the integrated Georgian electricity network;
- The development of a demand-supply management scenario and of a electricity generation energy and capacity adequacy assessment; and
- An assessment of the resilience of the system.

The TYNDP shall build on the national electricity sector investment plans. When preparing the TYNDP, the Transmission System Operators for Electricity shall conduct an extensive consultation process, involving all relevant market participants.

EU EXPERIENCE IN CREATION OF TYNDPS

The EU experience in developing their TYNDP should provide useful lessons learned for Georgia. This section contains the transitional process of developing the first three TYNDP for the EU in 2010, 2012 and 2014. Key issues in the description of the bi-annual TYNDPs are in bold text.

When creating a TYNDP, the ENTSO-E suggests that the following questions should be addressed:

- Are ENTSO-E proposed scenarios developed at the EU, regional or national level?
- Has modelling of the integrated EU network been included in the plan?
- Has consultation with all relevant stakeholders been conducted and has the outcome of these consultations been documented?
- Has an assessment of the system resilience been conducted?
- Have European, regional and national generation outlooks been prepared and are they consistent with each other?
- Is there coherence between national, regional and European TYNDPs?

In creation of TYNDP, the ENTSO-E used network studies, which enable detailed assessment of the behavior of the transmission grid based on different assumptions that are not captured by the market studies (for example, the effect of growing installed capacities of RES, peak demand weather conditions, etc.). The results of networks studies are used in development of regional investment plans. Customer demand and generation patterns are used in hourly market simulations. For more precise decision making regarding grid extensions, hourly values of marginal costs per country and cost differentials between countries are more useful in this respect.

At this point, all EU countries and those countries that have signed the Energy Community Treaty (EnCT) (Moldova, Albania, Kosovo, Macedonia, and Bosnia Herzegovina) must provide their TYNDP every two years to the ENTSO-E. The countries supplied their last TYNDPs in 2014 and will submit new TYNDPs in 2016. In addition, ENTSO-E created an EU level TYNDP.

Appendix 1 of this report is the outline of ENTSO-E's Guidelines on TYNDP development. The guidelines provide many details of extensive analyzes that should be undertaken during the development of the TYNDP. EU countries have been establishing such TYNDPs since 2010 while the EnCT countries are still in the process in improving their TYNDPs to ENTSO-E standards.

OVERVIEW OF THE EU TYNDP FOR 2010, 2012 AND 2014

A. TEN – YEAR NETWORK DEVELOPMENT PLAN 2010

The ENTSO-E's TYNDP 2010 realized progress in the objectives set forth by the EU Regulation EC 714/2009 by the following way:

- European TSOs developed scenarios, describing mid-term trends in development of RES;
- Investment requirements and projects derived from coordinated modeling of integrated networks between TSO's;
- Consultation of stakeholders has been performed to receive feedback of the report;
- The first TYNDP was the basis for seeking consistency with national and regional plans;
- ENTSO-E also created common procedures for TSOs to share the same methodological standards, enabling future TYNDPs to be based on consistent regional studies.

To meet future release of TYNDPs, the work on next issues of TYNDP need to start immediately after the publishing the first report and efforts will be concentrated on the three main concerns:

- Updating bottom-up scenarios and developing shared long-run, top down scenarios involving ACER, stakeholders, policy and decision makers;
- Developing common ENTSO-E pan-European market modeling, reflecting the forces which drive commercial flow of electricity and its translation into physical power flows; and
- Developing ENTSO-E wide common framework for the regional network studies based on pan-European scenarios and integrated network model for mid- and long-term planning.

B. TEN – YEAR NETWORK DEVELOPMENT PLAN 2012

In 2012 ENTSO-E published the second TYNDP. The package was comprised of six detailed regional investment plans, a Scenario Outlook and an Adequacy Forecast 2012-2020, as well as the pan-European TYNDP 2012 report. Compared to the TYNDP 2010, the key findings[1] in the 2012 TYNDP are as follows:

- **Permitting:** In assessing to the projects identified in ENTSO-E's pilot TYNDP 2010, the report finds that **one in three planned investments are experiencing delays in implementation due to long permitting processes**. This is the primary reason ENTSO-E considers the Commission's proposals on fast-tracking of transmission infrastructure projects in its draft Energy Infrastructure Package and in particular the proposal on a one-stop-shop and defined time lines for permit granting procedures as the most important step forward.
- **RES:** The TYNDP 2012 identified the need to invest €104 billion in the refurbishment or construction of roughly 52,300 km of extra high voltage power lines clustered into 100 investment projects across Europe. **80% of the identified 100 bottlenecks are related to the direct or indirect integration of RES** such as wind and solar power. Such massive development of RES is the main driver behind **larger, more volatile power flows, over longer distances across Europe**.

[1] Source: ENTSO-E: https://www.entsoe.eu/major-projects/ten-year-network-development-plan/tyndp-2012/Pages/default.aspx

- **Market Integration:** The commissioning of projects of pan-European significance could result in **Carbon dioxide (CO_2) savings of 170 Metric Ton Co_2 ($MtCO_2$)**, of which 150 $MtCO_2$ results from the connection of renewable generation technology and 20 $MtCO_2$ which stem from savings due to further market integration.
- **Grid Extension:** Extending the grid **by only 1.3% a year enables adding 3% generation capacity** and the reliable integration of 125 GW of RES. For **less than 2€ per Megawatt hour (MWh) of end-users' electricity bills** over the decade, the TYNDP 2012 proposed investments allow achieving the EU energy and climate goals in the most efficient and secure way.

The new context (i.e., RES expansion) in Europe certainly present significant challenges to operating reliably, securely and efficiently the European grid as it is listed below:

- The extensive development of carbon free generation facilities and their integration in the internal European energy market;
- Enhancement of competitive electricity trade;
- The connection of European energy system with neighboring systems; and
- Difficulties in grid development.

TSOs' individual and combined expertise and experience safeguards the security of supply, and demonstrates magnitude of the required collegial effort and readiness to respond to these challenges.

C. TEN – YEAR NETWORK DEVELOPMENT PLAN 2014

The TYNDP 2014 describes how ENTSO-E proposes to integrate by 2030 up to 60% of RES, respecting cost-efficiency and security through the planned strengthening of Europe's electricity power grid.

The complete TYNDP package consists of eight documents: the TYNDP 2014 full report, six detailed Regional Investment Plans and the Scenario Outlook and Adequacy Forecast (SO&AF) 2014-2030, along with the Comments Summary and the Comments Compilation collected during outreach of the draft plan.

The TYNDP was produced over two years of study with close engagement with various institutions and stakeholder organizations. A web-based public consultation on the reports was held from 10 July until 20 September, 2014, which supported the finalization of the TYNDP 2014 package[2].

The ENTSO-E submitted the TYNDP 2014 package to ACER for opinion on 31 October 2014 in line with Regulation (EC) 714/2009. In the meantime, small corrections to the 2014 TYNDP were made by ENTSO-E. In order to take into account the upcoming ACER opinion on the TYNDP 2014, changes may still be implemented in the margin of the TYNDP report document.

The key findings[3] the TYNDP 2014 are as follows:

Renewables: RES development is the **major driver for grid development until 2030**. The generation fleet will experience a major shift by 2030, with the replacement of much of the existing capacities with new generating capacities, most likely located differently and farther from load centers, and involving high RES development. Transmission network projects of pan-European significance help avoid 30 to 100 TeraWatt Hours (TWh) of RES spillage (power not needed), reducing it to less than 1% of the total supply. Liquidity in power markets will thus be enhanced, thereby limiting the volatility of prices.

[2] The process of creation of TYNDP 2014 is listed in Appendix 1

[3] Source: ENTSO-E: https://www.entsoe.eu/major-projects/ten-year-network-development-plan/tyndp-2012/Pages/default.aspx

- **Interconnection capacity boost**: The TYNDP 2014 identifies about 100 locations on the European grid where bottlenecks exist or may develop in the future if reinforcement solutions are not implemented. The most critical area of concern is the **stronger market integration to mainland Europe** of the four main "electric peninsulas" in Europe. **Interconnection capacity must double** on average throughout Europe by 2030.
- **Benefit to consumer bills**: Total investment costs for the portfolio of projects of pan-European significance amount to approximately **€150 billion**, of which €50 billion relates to subsea cables. This effort represents very significant financial engagement for TSOs. However, it only represents about 1.5-2 €/MWh of power consumption in Europe, i.e. about 2% of the bulk power prices or **approximately 1% of European consumers average**. Additionally, through the implementation of projects of pan-European significance, the increased market integration leads to an overall levelling of electricity prices in Europe, **mitigating electricity prices on average from 2 to 5 €/MWh** (depending on the energy scenario).
- **Environmental attention**: The electricity grid has an indirect, but vital positive effect on CO_2 emissions as it is a prerequisite to the implementation of clean generation technologies. By either directly connecting RES, avoiding spillage or enabling more climate-friendly units to run, the TYNDP 2014 project portfolio **contributes directly to approximately 20% of the CO_2 decrease by 2030**. Grid extensions foreseen in the TYNDP represent an increase in the total network length of 1%/year. This figure is relatively low when compared to the 3% to 5%/year generation capacity growth rate. Moreover, one third of these new grid assets are subsea and about 10% are upgrades of existing equipment. TSOs **optimize the routes** to avoid interference with urbanized or protected areas as much as possible.
- **Europe's technical leadership**: Investment needs call for appropriate grid reinforcement solutions, adapted to each specific situation. Project designs are thus built on **cutting-edge technologies, some of which are demonstrators of new technology and world firsts**. For example, the largest High Voltage Direct Current (HVDC) Voltage Source Converter[4] (VSC) equipment, the longest Alternating Current (AC) cable route, Direct Current (DC) and AC parallel operation, etc. The further development of smart grids, with the latest electronic tools and Information Technology (IT) systems, helps to optimize the operation of existing assets, to monitor, forecast and control distributed RES and load management.
- **Future energy policies**: The **resilience of the project portfolio** opens a large choice of options to fulfil European energy policy goals. Thousands of market situations considering all possible hazards that could adversely affect the power system have been simulated and processed for the TYNDP 2014. Both frequent and rare situations were analyzed under all four contrasting Visions for 2030. The TYNDP 2014 thus paves the way for the implementation of **the 2050 European energy goals**.

  For the TYNDP 2014, ENTSO-E has also improved the study tools and process to speed up and strengthen data collection, model calibration, consistency checks and the merging of pan-European and regional results. The quality of the integrated market and network modelling relies on the knowledge of all the specific features of every local power system in Europe, a detailed grid description, and the resulting ability to master and aptly cut through numerous parameters of high uncertainty. Thus, more than 100 grid concerns and investment projects from across Europe have been investigated within the limited timeframe of 2 years[5].

[4] HVDC - VSC technology is an advance technology mainly to enable more power to be shifted over a longer distance

[5] ENTSO-E Ten Year Network Development Plan 2014

OVERVIEW AND COMMENTS ON GEORGIAN TYNDP FOR THE PERIOD 2015 – 2025

The foundation for the Georgian TYNDP Plan 2015-2025 is the consideration of national energy policy goals and transmission plans necessary to achieve those goals. The key elements of the energy policy goals are as follows:[6]

- Develop a surplus of hydropower plants available for export;
- Develop the Georgian electricity sector's capability to serve as a hub for transmitting electricity to and between regional neighbors and into continental Europe through Greece and Bulgaria;
- Harmonization of policies for integration into the European Union's (EU) electricity market;
- Comprehensive rehabilitation of fully depreciated and obsolete facilities;
- Increase electricity reliability throughout the power transmission network and reduce energy insecurity and vulnerability;
- Development and construction of new power plants;
- Diversification of imported energy sources, including electricity; and
- Establishment of a commercially profitable economic model of the energy sector.

According to the Georgian Electricity and Natural Gas Law and the Georgian Transmission Grid Code, GSE is obliged to develop the Georgian TYNDP. The first Georgian TYNDP presents the time tagged program designed for reinforcing infrastructure of the Georgian national electricity transmission system, addressing the existing problems, responding to the future challenges and implementing the opportunities.

In creation of the TYNDP, GSE aimed to develop a stable, reliable, cost reflective and efficient transmission system ensuring:

- Network security;
- Power quality;
- Sufficient transfer capacity for integration of RES into the network;
- Sufficient transfer capacity for power exchange with neighboring countries;
- Preparedness for integration to ENTSO-E's TYNDP.

Creation of such a document is a positive step for development of the Georgian electricity transmission network. Taking into account that this is the first TYNDP for the region is a good foundation for development of the next TYNDP. The TYNDP developed by GSE can be used as a basis for sharing the experience and good practices with neighboring Emerging Markets.

[6] Georgian State Electric System's ("GSE") 2012 Annual Report

RECOMMENDATIONS FOR FURTHER DEVELOPMENT OF TYNDP 2017 – 2027

The development of the electricity transmission grid requires a long-term vision that is robust for relevant developments that determine the future use of the electricity grid. The EU experience in creation of the TYNDP is a good example of creation, implementation and monitoring of the TYNDPs and is applicable in implementation in Georgia.

By using of EU Member States' experience in creation, implementation and monitoring of TYNDPs, GSE will quicken the process of integration of RES and especially small hydro power plants in Georgia.

Therefore, the approach to develop the TYNDP should be generally similar to that used by ENTSO-E. While much of the ENTSO-E focus is on regional integration and cross-boundary transmission capacity, the *conceptual* approach can be applied and modified as needed for Georgia's internal and regional transmission planning. The following actions are recommended for the next TYNDP:

- In developing the TYNDP, GSE should include a consultation process with at least Georgian National Energy and Water Supply Regulatory Commission (GNERC), stakeholders, and policy makers.
- Efficient use of RES and mainly of small hydropower plants has increased at the regional level and on electricity markets on a large scale. Coordinated creation of a regional TYNDP with neighboring TSOs will be a good approach for integration of produced electricity generated from hydropower plants on a regional level.
- GSE created the Georgian Transmission System Development Indicators for the period 2015-2025. Now an internal process within GSE should be created for regularly monitoring the performance of these indicators.
- Detailed description of new transmission infrastructure projects will enable effective monitoring of the implementation of the TYNDP.
- For improvement of both scenario building and assessment of new transmission infrastructure projects, when developing the next TYNDP, GSE should include both electricity market studies and network studies.
- Need to include a description of market integration with neighboring markets. Market integration with neighboring markets is characterized by the ability of the power system to reduce congestion and thus provide an adequate Grid Transfer Capability (GTC) so that neighboring electricity markets can trade power in an economically efficient manner.
- Setting priorities of the investment projects based on internal and external congestion will fix the congestion problems in the future.
- Based on EU practice, introduction of hourly electricity planning model will present pricing, congestion and other system characteristics allowing GSE to forecast network development needs in more precise manner. Electricity Market Complex Adaptive System (EMCAS) model or other models (Proscreen, PROMOD, WASP) could be used by GSE as a tool for planning electricity grid development.
- The priorities of the projects should be reassessed. Social/economic welfare assessment should be more detailed. GSE should develop more appropriate criteria. Economic benefit of a proposed infrastructure project should have more importance during the decision making process and should be based on detailed feasibility study. A new project could have high scores for all criteria (Increased transfer capacity, integration of RES, increased security of supply, positive impact on transmission loss reduction, etc.) and low social/economic welfare, but the proposed project would still look good on paper and would have highest priority. Social/economic welfare is one

of the most important criteria in decision making process and should be paid more attention. Cost Benefit Analysis (CBA) should be carried out for each project analyzing investments/operational costs and possible revenues. The CBA will reduce risks of contracting infrastructure which will be unutilized and require additional funding to cover the investment costs.

- It is unclear what the underlying basis is for winter electricity demand growth and summer electricity demand growth. Summer electricity consumption in Georgia is increasing with higher rate than winter. And winter peak demand has been growing an average 1% from 2007 (2007 – 1712 MW and 2013 – 1810 MW).
- During the development of the next TYNDP, the country's electricity demand growth forecast should be based on more detailed analysis. GoG agencies (Ministry of Economic and Sustainable Development, Economic Council, etc.) should have clear view on electricity demand growth based on economic projections. Strategy 2020 lists the following priority economic sectors: Agriculture, Tourism and Transportation-all sectors with low energy intensity. Additional analysis is needed to correlate expected GDP growth by each economic sector and use the results of the analysis to predict the expected growth of electricity
- Taking into account past experience with the Black Sea Transmission Network Project (BSTNP), new interconnections with other electricity systems must be carefully analyzed and planned. Currently the BSTNP utilization rate is below 10% and the Georgia State has to subsidize loan repayments because the project is not meeting its minimum revenues levels. Detailed analysis should be conducted not only on Georgian electricity system, but on neighboring system as well, including ATC/NTC calculations, grid/generation development, market simulations, etc.
- In the stage of prioritizing projects, financial calculations should be carried out to calculate indicative transmission tariffs which would need to be introduced to meet revenue requirements for a specific project. Impact on total system tariffs should also be included in the analysis. Since the current level of Georgian transmission tariffs are quite high compared to other transmission tariffs in the region, additional increase of tariffs would jeopardize Georgia's goals to become a regional energy hub and promote trade renewable energy across borders and investments in hydropower sector.

APPENDICES:

1. Overview of the ENTSO-E TYNDP 2014 process[7]
2. Outline of ENTSO-E Guidelines on TYNDP

Appendix 1 Overview of the ENTSO-E TYNDP 2014 process[8]

Step	Period	Responsible	Activities
Exploration studies	Q3 2012 – Q2 2013	ENTSO-E Regional Groups	Preliminary studies to assess 2030 Visions. This involves preparation of the regional lists of projects to be assessed and included in the TYNDP 2014.
First call for third party projects	21 January 2013 – 1 March 2013	Third party promoters (transmission only)	Third party promoters are required to submit projects for inclusion in the TYNDP 2014.
First call for third party projects	1 March 2013 – 30 April 2013	ENTSO-E	Assess the compliance of the third party project submissions against the third party procedure.
Pan-European market studies	Q4 2012 – Q3 2013	ENTSO-E	Perform pan-European market studies for the four ENTSO-E 2030 Visions, used as boundary conditions for ENTSO-E Regional Groups to perform their regional market study based on which CBA indicators are calculated.
Assessment phase – Vision 1	Q2 2013 – Q3 2014 with preliminary results shown in Q4 2013 (Q2 2014 for third party projects accepted in the 2nd call)	ENTSO-E/ ENTSO-E Regional Groups	Assess all the projects on Vision 1 – based on market and network studies, each project is assessed using the CBA methodology.
Second call for third party projects	23 September 2013 – 20 October 2013	Third party promoters (transmission + storage) (whether in the 2013 PCI list or not)	Third party promoters are requested to submit projects for inclusion in the TYNDP 2014.
Second call for third party projects	20 October 2013 – 30 October 2013	ENTSO-E	Assessing third party submissions against compliance with the third party procedure (to determine whether projects can be included in the 2013 PCI list or not).
Delivery of preliminary Vision 1 of third party projects	November 2013	ENTSO-E	Preliminary results of the assessment of projects for Vision 1 (incl. third parties), which were submitted in the 1st call, to be communicated to third party promoters.
Communication of preliminary CBA Vision 1 results	26 November 2013	ENTSO-E Regional Groups	Presentation of the preliminary results of Vision 1 assessments of TYNDP projects.

[7] Source: ENTSO-E

[8] Source: ENTSO-E

Assessment phase – Vision 1 – third party projects of second call	November 2013 – March 2014	ENTSO-E Regional Groups	ENTSO-E assesses projects that were submitted in the 2nd call for third party projects – including storage projects – against Vision 1.
Assessment phase – Vision 4 and remaining Visions (2&3)	November 2013 – Q3 2014	ENTSO-E Regional Groups	Assess all projects on Vision 4 and remaining Visions (2&3). Based on market and network studies, each project is assessed using the CBA methodology that ENTSO-E submitted to EC ACER and Member States on 16 November.
Consultation on the TYNDP 2014 and Regional Investment Plans	July 2014 – September 2014	ENTSO-E	Public consultation on the TYNDP and Regional Investment Plans. Reports will include CBA results for all accepted third party projects and all TSO projects assessed within ENTSO-E's Regional Groups. For non-mature projects, the CBA assessment may not be complete.
Publication of TYNDP 2014	December 2014	ENTSO-E	The finalized TYNDP package will be published and submitted to ACER.

Appendix 2 Outline of ENTSO-E Guidelines on TYNDP

1.1. Introduction

- 1.1.1. Role of ENTSO-E in creation of TYNDP
- 1.1.2. Objectives of the TYNDP
- 1.1.3. Creation of the TYNDP 2010, 2012, 2014

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- 1.2.1. Main features on EU grid operation
- 1.2.2. Role of the TSOs
- 1.2.3. Transmission network and the Internal EU power market

1.3. Development of European Grid

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- 1.3.4. Development of internal EU power market

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- 1.4.2. Consistency checks
- 1.4.3. Adequacy forecast
- 1.4.4. Scenario 20.20.20
- 1.4.5. EU 2020 targets
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- 1.4.7. Consultations with stakeholders in the process of building of 20-20-20 scenario
- 1.4.8. Demand forecast
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- 1.4.10. Generation adequacy forecast
- 1.4.11. Economic consistency
- 1.4.12. 20-20-20 indicators
- 1.4.13. Consumption indicators
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- 1.5.2. Connection and integration of RES and new power plants
- 1.5.3. Internal energy market

1.6. Foreseen investments on the EU power grid

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- 1.7.2. Technical criteria and methodology of network studies
- 1.7.3. Grid analysis
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1.8. Economic analysis and prioritization criteria

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- 1.8.3. Security of Supply
- 1.8.4. Integration of RES
- 1.8.5. Internal energy market

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